Appl. No. 10/716,309   <u>PATENT</u>
Amdt. dated March 6, 2006
Reply to Office Action of September 6, 2005

<u>Amendments to the Claims:</u>

This listing of claims will replace all prior versions, and listings of claims in the application:

<u>Listing of Claims:</u>

1   1.   (Currently Amended) A method for placing circuit elements into logic
2   blocks, the method comprising:
3   assigning each of the circuit elements to a separate abstract block, wherein the
4   circuit elements are part of a user design for a programmable integrated circuit <u>and the abstract</u>
5   <u>block represents a functional attribute of its assigned circuit element</u>;
6   grouping each of the abstract blocks into a logic block <u>based at least in part on a</u>
7   <u>correspondence between a functional attribute of the logic block and the functional attribute of</u>
8   <u>each abstract block</u>;
9   removing a first one of the abstract blocks from ~~a~~ <u>the</u> logic block in response to
10   placement information that indicates a design goal would be improved by rearranging at least a
11   portion of the user design; and
12   placing the first abstract block into a different logic block on the programmable
13   integrated circuit<u>, wherein the functional attribute of removed abstract block corresponds with a</u>
14   <u>functional attribute of the different logic block</u>.

1   2.   (Original) The method according to claim 1 wherein the design goal
2   includes routability and signal timing in the user design.

1   3.   (Original) The method according to claim 1 wherein the circuit elements
2   include lookup tables and registers.

1   4.   (Original) The method according to claim 1 wherein the circuit elements
2   include DSP blocks and RAM blocks.

1   5.   (Original) The method according to claim 1 further comprising:

2   determining whether placing each circuit element into the logic block violates any

3   of a set of design rules relating to the logic block, wherein the logic blocks are grouped into

4   clusters; and

5   determining whether placing each of the circuit elements into a cluster violates

6   any of a set of design rules relating to the cluster.

1   6.   (Original) The method according to claim 5 wherein each of the abstract

2   blocks are grouped into a cluster based on an attraction of the abstract block to the cluster, and

3   the attraction measures a number of nets and connections of nets absorbed into the cluster if the

4   abstract block is placed inside the cluster.

1   7.   (Original) The method according to claim 5 wherein each of the abstract

2   blocks are grouped into a cluster based on an attraction of the abstract block to the cluster, and

3   the attraction measures a number of timing critical connections absorbed into the cluster if the

4   abstract block is placed inside the cluster.

1   8.   (Original) The method according to claim 5 further comprising:

2   placing one of the abstract blocks into another logic block within the cluster if

3   placing that abstract block into the logic block violates any of the design rules relating to the

4   logic block; and

5   placing one of the abstract blocks into another cluster if placing that abstract

6   block into the cluster violates any of the design rules relating to the cluster.

1   9.   (Currently Amended) The method according to claim 1 wherein the logic

2   blocks implement functions performed by two lookup tables with less than an integer k unique

3   input variables; and the method further comprises:

4   determining whether grouping each of the abstract blocks into the logic block

5   placing each of the abstract blocks into the logic blocks causes any of the logic blocks to have

6   more than k unique input variables.

1   10.   (Original) The method according to claim 1 wherein the placement

2   information includes floorplanning information.

1   11.   (Original) The method according to claim 1 wherein the placement

2   information includes partition information.

1   12.   (Currently Amended) The method according to claim 1 wherein the

2   placement information includes data obtained by a previous placing placement of a portion of the

3   user design on the programmable integrated circuit.

1   13.   (Original) The method according to claim 1 wherein:

2   grouping each of the abstract blocks into a logic block further comprises grouping

3   first and second abstract blocks into a first logic block;

4   removing the first one of the abstract blocks from the logic block further

5   comprises removing the first abstract block from the first logic block; and

6   placing the first abstract block into a different logic block further comprises

7   placing the first abstract block into a second logic block and placing the second abstract block

8   into the first logic block.

1   14.   (Currently Amended) A computer program product stored on a computer

2   readable medium for placing circuit elements in a user design for a programmable integrated

3   circuit into logic blocks, the computer program product comprising:

4   computer program instructions code for assigning each of the circuit elements to a

5   separate abstract block, wherein the abstract block represents a functional attribute of its assigned

6   circuit element;

7   computer program instructions code for grouping each of the abstract blocks into

8   a logic block based at least in part on a correspondence between a functional attribute of the

9   logic block and the functional attribute of each abstract block;

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10   <u>computer program instructions</u> ~~code~~ for determining whether placement

11   information indicates that a design goal would be improved by moving at least one of the

12   abstract blocks into a different logic block; and

13   <u>computer program instructions</u> ~~code~~ for removing the at least one abstract block

14   from a first logic block and placing the at least one abstract block into a second logic block in

15   response to the determination based on the placement information<u>, wherein the functional</u>

16   <u>attribute of the removed abstract block corresponds with a functional attribute of the different</u>

17   <u>logic block.</u>

1   15.   (Original) The computer program product as defined in claim 14 wherein

2   the design goal includes signal timing and routability in the user design.

1   16.   (Currently Amended) The computer program product as defined in claim

2   14 wherein the logic blocks are grouped into clusters of logic blocks, and the <u>computer program</u>

3   <u>instructions</u> ~~code~~ for grouping each of the abstract blocks into a logic block further comprises

4   <u>computer program instructions</u> ~~code~~ for grouping each of the abstract blocks into a cluster of

5   logic blocks based on an attraction of the abstract block to the cluster.

1   17.   (Currently Amended) The computer program product as defined in claim

2   16 further comprising:

3   <u>computer program instructions</u> ~~code~~ for determining whether grouping the

4   abstract blocks into the clusters violates any design rules of the clusters; and

5   <u>computer program instructions</u> ~~code~~ for determining whether grouping the

6   abstract blocks into the logic blocks violates any design rules of the logic blocks.

1   18.   (Original) The computer program product as defined in claim 14 wherein

2 some of the circuit elements are lookup tables, and some of the circuit elements are registers.

1   19.   (Original) The computer program product as defined in claim 16 wherein

2 the attraction measures a number of nets and connections of nets absorbed into the cluster if the

3 abstract block is placed inside the cluster.

1   20.   (Original) The computer program product as defined in claim 16 wherein

2 the attraction measures a number of timing critical connections absorbed into the cluster if the

3 abstract block is placed inside the cluster.

1   21.   (Currently Amended) The computer program product as defined in claim

2 17 further comprising:

3   computer program instructions ~~code~~ for placing one of the abstract blocks into

4 another logic block if placing that abstract block to the logic block violates any of the design

5 rules relating to the logic block.

1   22.   (Currently Amended) The computer program product as defined in claim

2 17 further comprising:

3   computer program instructions ~~code~~ for placing one of the abstract blocks to

4 another cluster if placing that abstract block to the first cluster violates any of the design rules

5 relating to the first cluster.

1   23.   (Currently Amended) The computer program product as defined in claim

2 14 further comprising:

3   computer program instructions ~~code~~ for determining whether placing the abstract

4 blocks to the logic blocks causes any of the logic blocks have more than k unique input variables,

5   wherein the logic blocks are configurable to implement functions performed by

6 two lookup tables with less than k unique input variables.

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1   24.   (Original) The computer program product as defined in claim 14 wherein

2   the placement information includes floorplanning information.

1   25.   (Original) The computer program product as defined in claim 14 wherein

2   the placement information includes partition information.

1   26.   (Original) The computer program product as defined in claim 14 wherein

2   the placement information includes data obtained by placing logic blocks that implement

3   portions of the user design on the programmable integrated circuit.

1   27.   (New) The method of claim 1, wherein the logic block includes a first

2   functional attribute and a second functional attribute, and wherein grouping each of the abstract

3   blocks into a logic block further comprises:

4   assigning a first abstract block associated with a first circuit element to the first

5   functional attribute of the logic block; and

6   assigning a second abstract block associated with a second circuit element to the

7   second functional attribute of the logic block, such that the logic block is assigned the functional

8   attributes of the first and second circuit elements.

1   28.   (New) The method of claim 27, wherein the first functional attribute of

2   the logic block includes a register and the functional attribute of the first circuit element includes

3   a register.

1   29.   (New) The method of claim 27, wherein the second functional attribute of

2   the logic block includes a look-up table circuit adapted to implement a logic function and the

3   functional attribute of the first circuit element includes a logic function capable of being

4   implemented by the look-up table circuit.